

# Glyconutrients in More Detail

Glyconutrients are supplements that contain monosaccharides (or simple sugars), something that some nutritionists and healthcare professionals believe have become deficient in today's over-processed and fast-food laden diets.

## ***Essential vs Non Essential Nutrients***

Nutrients can be classified into two groups, non-essential and essential. Non-essential nutrients are the types of things our body produces naturally, such as cholesterol, that may be present in our diet and utilized by our bodies, but we don't need to eat them in order to enjoy good health. Essential nutrients, on the other hand, are those that our body needs, but cannot produce on its own. Examples of essential nutrients are certain vitamins, minerals, fatty and amino acids that can be obtained either by a proper diet or via supplementation. This is where the debate begins. Are glyconutrients essential or non-essential?

## ***Getting Enough Sugar is not the Problem***

The body has naturally occurring enzymes that have the ability to convert carbohydrates back to glucose, their simplest form. So why the need to supplement? Glyconutrient proponents suggest that it is not the lack of sugar in our diets that is the overriding problem, but rather the types of sugars we are lacking. There are simple sugars, known as saccharides, considered necessary for our bodies to function optimally:

- Xylose
- Fucose (not to be confused with fructose)
- Galactose
- Glucose
- Mannose
- N-acetylglucosamine
- N-acetylgalactosamine
- N-acetylneuraminic acid

These sugars work with the fats and proteins in our bodies in order to produce a sort of communication device that exists on the outer membrane of every cell allowing cells to recognize and interact with each other. But in order for this device to work as a high functioning part of the entire bodily system, all eight sugars must be present.

## **Xylose**

### ***Overview of Xylose***

Xylose is a great alternative to white sugar and has none of the negative side effects of sugar. On average, a half a cup of sugar is consumed per person every day in the United States. On the glycemic index, which measures the rate of the absorption of sugar by the body, sugar is a 100 while Xylose is only a 7.

Xylose is a natural sugar that is found in some woody materials such as straw, pecan shells, cottonseed hulls, and corncobs. It is also found in berries, spinach, broccoli, and pears. It is extracted through a scientific process. In addition to this, your body actually produces a small amount of Xylose on its own.

### ***History of Xylose***

Finland was going through a sugar shortage due to World War I, and they wanted an alternative. Due to this quest, Xylose was discovered in 1891 by a Finnish scientist named Koch. He was able to isolate the Xylose from wood and prove its properties.

Although the discovery had been made, being able to actually use Xylose as a sugar substitute was still years away.

In 1930 World War II again produced sugar shortages. Scientists began to work harder in figuring out how to stabilize Xylose and use it as a sugar alternative. They were successful and Xylitol was born. Xylitol is the sugar alcohol produced from Xylose.

In the 1960's Xylitol was being widely used in Europe and Japan both as a sweetener and for medicinal purposes. It wasn't until 1963 when Xylitol was approved by the FDA, that it was introduced into the United States.

Many studies have been done since that time on the absorption of Xylose by the body. Those studies have deemed it completely safe to be used as a sugar substitute. It is now used in all kinds of reduced calorie foods in the form of Xylitol both in the United States and around the world. It can take on many forms including a crystallized form that can be used in baking just as white sugar would be.

### ***Benefits of Xylose***

Xylose is safe for use in foods. It is antibacterial and antifungal and contains natural healing agents. For this reason, it's become popular in many arenas.

Many physicians and health care professionals recommend Xylitol as a substitute for sugar. Unlike cane sugar, Xylitol does not cause tooth decay. In fact, Xylitol is found in many products that can fight tooth decay. It can therefore be safely used in tooth pastes, mouth wash, and sugar-free gum. According to studies 75% of adults suffer from some kind of gum disease. Xylitol can actually improve some of the decay and aid in overall dental health as it decreases the ability of bacteria to cling to teeth.

Because Xylitol has no carbohydrates, it is used in many diet and reduced calorie foods. It has a higher fiber content giving foods less calories and more fiber. A high fiber diet aids both weight loss and digestive health.

The Benefits of Xylitol are many from weight loss to lowering insulin levels. It can also restore hormonal balance and lessen the symptoms of PMS. Xylitol can lessen diabetic symptoms.

## ***Healthy Claims of Xylose***

With the cases of type 2 diabetes consistently on the rise in the United States, an alternative to sugar is needed. The biggest factor in developing type 2 diabetes is the amount of sugar a person consumes. When white sugar is introduced into the body it raises the body's insulin levels. After years of this, the body can no longer handle the sugar and type 2 diabetes is often the result. In contrast, when Xylitol is introduced into the body it does not raise insulin levels as white sugar does. This makes it a great alternative for people with diabetes, or a likelihood of getting the disease.

Xylitol has many positive affects in the digestive process. In studies, it has been shown to prevent cancer of the digestive tract. A Xylose tolerance test has been developed. In this test, the amount of Xylose that is absorbed in the intestines is determined. This can help diagnose Crohn's Disease and other intestinal conditions. Studies have shown that if the absorption rate of Xylose can be increased, it may reverse colitis and even diabetes.

Xylose causes the growth of positive elements in the intestines. Through this, more absorption of all nutrients can take place. More absorption of nutrients equals a better overall immune system.

Xylitol is also a big component in fighting middle ear infections in children. Reoccurring ear infections put children at risk for surgery and even speech delay. Xylitol can help as it decreases the ability of bacteria to cling to tissue in the ear. A study showed that children who chewed Xylitol gum reduced their chances of developing an ear infection by 40%.

Xylitol, when used in a nasal spray, can help reduce the number of bacteria that can live in the nasal cavity. When bacteria are decreased, the effects of allergies and asthma are also reduced.

Xylitol has added health benefits for the elderly as well. Xylitol can aid in the increase of bone density. Studies show that the introduction of Xylitol into the body actually increases bone density. According to these studies, it can reverse damage that has already occurred. This is great news for those suffering from osteoporosis. A study also showed that when people over the age of 60 chewed two pieces of gum containing Xylitol two times a day, they decreased their risk for thrush and other mouth sores.

## ***Recommended Daily Allowance of Xylose***

As stated before, Xylose is safe to consume and has no known toxic levels. It is recommended in daily amounts up to 35 grams. The results of some Finnish studies have led some scientist to even recommend 40 grams per day. Because of the absorption rate, it is suggested that the recommended daily allowance of Xylose be taken in two separate doses.

## ***Summary of Xylose***

In conclusion, Xylose is a safe, healthy, toxin free substance that can allow people to enjoy the flavor of sugar without negative side effects on the body. The health benefits of eating foods or chewing gum with Xylitol are numerous. It can even reverse some damage that has already been done. In addition to being an ingredient in **glyconutrients** supplements, Xylose is a safe sugar substitute with numerous benefits.

## **Fucose**

There are two forms of Fucose, the L form, which is the common form of the sugar and the D form, which is a synthetic made from galactose. Many mistake Fucose for Fructose, the monosaccharide most commonly found in honey and fruit. Studies are showing that Fucose significantly aids the treatment of several conditions and diseases.

Fucose is quickly absorbed by the small intestines and made into glycoproteins, which help the metabolism function. What isn't absorbed by the small intestines is absorbed by the common "friendly" intestinal bacteria in your body.

Where is Fucose found in the body? There are four different areas of the body where Fucose is found. One is at the junctions of nerves, which could suggest that a deficiency could potentially cause your nerves to stop talking to the brain. The second is found in the kidney, making Fucose essential for normal kidney function. It is also found in the testes. This shows that Fucose is vital for human reproduction. The fourth area of the body where Fucose is found is in the outer layer of skin. This shows that it plays a vital role in skin hydration. Clearly, this substance is vital to healthy functioning of the body.

### ***History of Fucose***

Fucose has had a relatively short history behind it. Science has just recently figured out that Fucose is one of the essential sugars that the body needs to function properly. Studies on Fucose are very promising and show benefits as an immune modulator, an anti-inflammatory agent, and as a neuron transmitter. Recent studies also show that Fucose can play a pivotal role in the reduction of tumor size in cancer patients. It also has the ability to kill cancer cells.

### ***Benefits of Fucose***

Fucose is a beneficial immune modulator. Studies are showing that the benefits of Fucose in the body may help to suppress overactive immune systems or auto immune disorders. Essentially, it helps to normalize the immune system and help it run efficiently. In addition to this, Fucose has the ability to kill bacteria and help the body strengthen itself against infections. Fucose helps the cells in the body deflect bacteria so that infection can be fought off more efficiently.

Fucose is also showing promise as an anti-inflammatory agent and can help alleviate symptoms for those who suffer from allergic skin reactions. More research shows a connection to brain activity which presents many exciting possibilities. That's because fucose is also showing promising signs of neuron transmission in the brain, which ultimately helps the brain communicate with itself and your body more efficiently. Based on this evidence, scientists are investigating the possible ways in which Fucose helps those who suffer from Alzheimer's disease. This is just one possibility, and further research may reveal more.

### ***Healthy Claims of Fucose***

Research is beginning to show just how beneficial Fucose can be for the body. It's beginning to play a significant role in the hunt for the cure of various diseases. In fact, studies being conducted right now show that Fucose can possibly help kill cancer cells. Nothing is conclusive yet, but Fucose has the potential to reverse leukemia and breast cancer by suppressing tumor growth.

Studies also show that levels of Fucose are low in those with Rheumatoid Arthritis. Research shows that supplementing the body with the Fucose it lacks can help to effectively treat this painful and limiting disease. In fact, when the supplements were taken away from the body (of patients in tests) Rheumatoid Arthritis advanced more rapidly than it did during the period of supplementation.

In fact, studies are also showing that Fucose levels are lower in those with these health problems: diabetes, cystic fibrosis, liver disorders, and shingles. Fucose is also showing promise in deflecting the herpes virus from the body.

One reason that this substance seems to affect so many different symptoms and diseases is because of its versatility in its delivery. Fucose can be administered directly to the part of the body that needs it the most. For example, it can be administered directly to the skin for help with psoriasis. Or, it can be incorporated into the retina in order to help with the rod function of the eye.

### ***Recommended Daily Allowance of Fucose***

Fucose is shown to have very little ill effect on humans when taken in extremely high doses. But, in order to maximize treatment, an average 150 pound adult can consume 34 grams daily of Fucose safely. Fucose is eliminated from the body during urination, so maximum levels of Fucose in the blood can be expected up to an hour after being taken. It's eliminated from the body anywhere from 8 to 12 hours later. Because of this, Fucose should be taken twice daily in order to ensure that the body constantly has the right levels of Fucose in it at all times.

Fucose can be taken as a supplement or found readily in seaweeds like kelp as well as in medicinal mushrooms and beer yeast. It may be difficult for many people to incorporate these dietary sources on a daily basis, and that is when the supplemental forms are recommended.

### ***Summary of Fucose***

To recap, Fucose is a monosaccharide that is considered to be one of the essential sugars, or **glyconutrients**, that the body needs to function properly. It is a relatively new phenomenon that is being studied in order to help such diseases as Alzheimer's. Fucose is located in the nerves of the body, the kidneys, the testes, and the outer layer of the skin. But, new studies are showing that Fucose can be administered to the body wherever a deficiency resides. In fact, many people with diseases like Rheumatoid Arthritis, diabetes, cystic fibrosis, etc. have a massive Fucose deficiency in the body. As research continues on Fucose, the scientific community is starting to notice a trend. Fucose can help inhibit the growth of tumors as well as kill cancer cells in the body.

Despite the fact that studies on Fucose have really only just began, the scientific community has made some startling breakthroughs that indicate promising possibilities for a number of disease sufferers.

## **Galactose**

Galactose is also referred to as "brain sugar." This substance is not as sweet as glucose and it gives food energy to the body. This is a naturally made substance in the body, and vital for proper functioning.

## ***Overview of Galactose***

One of the properties of galactose is that it produces a lot of energy with a smaller amount of product. As a supplement or manufactured substance, it has a long shelf life and tastes similar to sugar. One drawback to using this substance is that it doesn't dissolve in liquids as easily as sugar does. For this reason, it is not usually used for home baking. Galactose is used by commercial bakeries as a sweetener. It is also used to tone down overly acidic or tart flavors in foods.

## ***History of Galactose***

Galactose is found in several types of food, including sugar beets and dairy products. It is also produced naturally in the human body. In fact, galactose plays an important part in breast feeding. During lactation, one of the processes that take place is for the mother's body to convert glucose to galactose. This conversion is responsible for lactose being created and it also helps the breast milk to let down or release so the baby can feed.

When we consume dairy products, our bodies break down the lactose into galactose. From that point, the galactose is broken down even further by the body's enzymes into other types of sugars which it needs. The problem with consuming a lot of dairy products is that the excess amount of Galactose will remain in the bloodstream. It can also be stored in the ovaries.

A study conducted in the late 1980s looked at thousands of women who had been diagnosed with ovarian cancer and a group of women without this disease. The difference between the women who had been diagnosed with ovarian cancer, as opposed to the cancer-free women was the amount of dairy products they had in their diet.

The study further concluded that milk fat was not responsible for the development of cancer. Rather, it was the sugar contained in the milk that was the culprit. Consuming yogurt and cheese may have put the woman at increased risk because the bacteria these products contain caused the conversion of lactose to galactose to speed up.

Prostate cancer has also been linked to consumption of dairy products, and by extension, galactose. Men who consumed a higher amount of dairy products were more likely to develop prostate cancer than those with a lower intake. The risk of developing prostate cancer increases by as much as 2.5 times when dairy products make up a sizable portion of a man's diet.

## ***Healthy Claims of Galactose***

Galactose makes up between 2-8% of milk solids. It is one of the saccharides that the body needs to form cells and organs. Galactose is an important component of the immune system and the way that the body's cells communicate with each other. This is a nutrient that is essential to obtain in your daily diet.

Scientists did not realize how important substances like galactose were to the body's chemistry until quite recently. Studies are still being conducted to learn more about this it and what it does. Research is ongoing into the effect that sugars have on immune systems in mammals, including humans. It will be some time before scientists have the answers they seek to this puzzle, but they have concluded that the body's immune system needs essential sugars, like galactose, in order to function properly.

Galactose is an important component of the messaging system that operates between cells. They need to have a way to send messages to each other about what kinds of cells they are. If this system didn't exist, then individual cells would not be able to tell whether other cells in the body are "friendly" or not. The antibodies the body produces would not be able to tell which cells it should be attacking and which ones should be left alone. Without sufficient galactose, the body's immune system would break down, putting the individual at increased risk for disease.

### ***Recommended Daily Allowance of Galactose***

The recommended daily allowance of galactose is 50 grams per day for adults who are healthy. Most of this will be eliminated within about eight hours after ingestion. If you are going to take galactose supplements, you should spread your consumption out through the day, as opposed to taking the full dosage at one time.

### ***Summary of Galactose***

Galactose, also known as "brain sugar" is similar to glucose, although it is not as sweet. It gives a greater amount of energy than granulated sugar with a smaller amount of product. Galactose is not generally available for home use, since it does not dissolve easily in liquids like sugar does. However, it is available in numerous supplements for health purposes. Commercial bakeries do use it when they prepare products for sale. Galactose is not used only in place of sugar; it can also be used to tone down a tart taste or cut out the acidity of certain foods.

Galactose is present in milk and other dairy products, along with sugar beets. When someone drinks milk or consumes dairy products, their body breaks the lactose down into galactose. Some kinds of cancer, namely ovarian and prostate, have been linked to consuming milk and research is on going to determine if the risk is from excessive amounts or a hereditary link.

On a more positive note, galactose is an important part of keeping the body's immune system healthy. It is an important part of the process needed to form cells. In addition, galactose is part of the body's system of communicating between cells.

If you didn't have sufficient galactose in your body, your immune system wouldn't be able to function. It wouldn't know which cells are "good" and should be left alone, and which ones should be attacked by the body's antibodies.

Research is continuing into the role that galactose and other **glyconutrients** play in keeping the immune system functioning properly. Consume 50 grams each day of galactose to keep your immune system healthy. If you are going to use a supplement, divide your intake up throughout the day, as opposed to taking a single dose.

## **Glucose**

Glucose is the human body's main source of energy. When we digest carbohydrates, they are converted into this substance. When humans are not able to keep the levels of glucose in the bloodstream regulated correctly, they may develop diabetes.

## ***Overview of Glucose***

Carbohydrates ("carbs") include such foods as pasta, rice, wheat products, potatoes, and fruits. Some vegetables also fall into this category. Processed foods, especially sweets, are definitely carbs.

When we eat them, our digestive system breaks down the sugar and the starch into glucose. The energy from the glucose gets into the bloodstream through the small intestine. After the glucose hits the bloodstream, it is combined with insulin. This insulin and glucose mixture enters the muscles and the brain, which provides energy so that the body can think and move.

Any extra glucose the body produces is stored in the liver, so that there is a certain amount in reserve in case the normal glucose levels start to drop. The pancreas can speed up or slow down production of insulin, as appropriate. If a person develops diabetes, their body is not able to keep their glucose levels at the correct level. They may need to inject themselves with insulin, or the condition may be treated by following a special diet.

## ***History of Glucose***

Insulin was discovered in 1921-22 by Frederick Banting and Charles Best. Prior to their discovery, people with diabetes were put on a special diet, but this was only a temporary measure. This type of diagnosis was a death sentence, since the person would lose weight and waste away over time. The diet would only keep them alive for a matter of months or perhaps a year, but eventually the individual would succumb to malnutrition and starvation.

Dr. Banting came up with a theory that insulin was produced by the pancreas. Before this point in history, no one understood why a person with diabetes had such a high amount of sugar in their blood and urine.

In January of 1922, Banting and Best were ready to test insulin on humans. The first person to be injected with this substance was Leonard Thompson. The 14-year-old boy had been diagnosed with diabetes in 1919 and had dropped down to 65 lbs. His condition had deteriorated to the point where he was expected to go into a coma and die.

After being given insulin, his symptoms began to improve. His blood sugar levels returned to normal and he gained strength. This substance that was derived from the pancreas was proven to be an effective treatment for diabetes.

## ***Benefits of Glucose***

You need to have an adequate amount of glucose in your body to give your brain and muscles the fuel they need to function properly. If the glucose levels drop too low and you have hyperglycemia, you may have a headache, feel dizzy, experience anxiety, or have trouble speaking or concentrating.

When glucose levels drop too low in the body, this condition is called hypoglycemia. This condition makes the individual feel tired. Excessive thirst and urination may be signs that your body is not producing enough insulin. All of these are signs of diabetes.

## ***Healthy Claims of Glucose***

If you are able to keep your glucose levels in the appropriate range, you will enjoy good health. You will have energy to get through the day and will be able to keep your weight regulated. One of the signs of having too much glucose in your body is that you lose an excessive amount of weight. Having an excessive amount of glucose in your system also makes it harder for cuts and bruises to heal; it takes longer than usual to get better if you injure yourself.

Keeping your glucose levels in the healthy range will also help you stay healthy in the long run. It will help to prevent heart disease, kidney disease, and nerve damage.

The main reason for getting an adequate amount of glucose is so that the muscles in your body have the food that they need to work properly and to heal themselves after exercising or you get hurt. When you exercise vigorously, it causes small tears in the muscle that your body needs to repair; the good news is that this process helps to strengthen your muscles over the long term.

## ***Recommended Daily Allowance of Glucose***

There isn't a specific recommended daily allowance for glucose. As long as you are consuming grain products, rice, or pasta as part of your diet, you are getting carbohydrates that your body can break down into glucose. This substance is so important to our health that if you were in a situation where you were starving, your body would start breaking down its own protein to keep the brain and muscles fed.

A good policy to follow is to get approximately 8% of your daily calories from glucose. If you were consuming 2,000 calories daily, then you would want to consume no more than 10 teaspoons of sugar in the foods you are eating.

## ***Summary of Glucose***

Glucose and other **glyconutrients** provide fuel for our bodies. We get this fuel when we consume carbohydrates. Carbs are found in such foods as rice, pasta, grains, and potatoes. Think starchy foods and you have a good idea of what carbs are. They may have gotten a bad name in the press recently, but you need to consume them to give your body the fuel it needs.

This substance is so important that any excess glucose is stored in the liver in preparation for a time when you haven't eaten enough carbs. Glucose mixes with insulin, which is produced by the pancreas, and is distributed to the body's muscles and the brain.

A person who is unable to produce enough insulin on his or her own develops diabetes. Before the link between insulin and diabetes was discovered by Dr. Frederick Banting and Charles Best in 1921-22, getting diabetes was a tragedy. It resulted in a slow death for all sufferers. Now people with diabetes can inject themselves with insulin or follow a special diet to stay healthy.

Keeping your glucose levels in the healthy range means that you will feel better and live longer. You are less likely to develop heart or kidney disease, and you will have the energy you need to perform your daily activities.

## Mannose

Mannose is a naturally occurring sugar that is considered to be a safe alternative for the treatment of urinary tract infections (UTIs). The success rate of treatment of UTIs through the use of mannose is rated to be as high as 80 to 90%. The kind of UTI-causing bacteria that mannose works on to disable their effects and relieve symptoms of UTI, cause a majority of all UTI cases. Therefore, it can be said that the success rate of mannose is this high because of its efficacy against these most common UTI-causing bacteria.

Mannose has been found to be especially effective in the treatment of UTI because it is absorbed slowly into the body. In fact, mannose has been found to be absorbed as much as 8 times slower into the body than glucose. Unlike glucose, Mannose is not taken into the body to be converted into glycogen or accumulated in the liver. Instead, it moves through the kidneys where it is filtered, and then sent to the bladder.

The lining of the bladder consists of polysaccharide molecules. A UTI infection is triggered when E coli bacteria attach themselves to these polysaccharide molecules. When mannose is routed to the bladder however, the E coli bacteria attach themselves to these mannose molecules, instead of adhering to the lining of the bladder. When the person urinates, both the E coli bacteria and the mannose molecules are thus expelled from the body naturally, eliminating the chances of an infection.

### ***Overview of Mannose***

Mannose is a sugar monomer that belongs to the hexose (monosaccharide with 6 carbon atoms) group of carbohydrates. It is formed with the oxidation of mannitol, a polyol used as diuretic agent, or through D-Glucose.

It is one of the most important sugars as far as its nutritive and therapeutic values are concerned. The most common sources of mannose are Cranberries, red currants, black currants, peaches, gooseberries, aloe vera and soy beans. It is also found in abundance in vegetables like cabbage, beans, egg plant, capsicum, turnip, and tomatoes and broccoli. Fenugreek seeds, kelp and shitake mushrooms are another important source of mannose.

Mannose is one of the easiest sugars to obtain in its natural form since most of these fruits and vegetables, legumes and herbs are available in abundance in nature. Sources like fenugreek seeds, kelp, and shitake mushrooms are easily available in specialty stores. Sources like aloe vera can actually be grown in your garden to provide an endless supply of mannose.

The composition of mannose in its natural sources depends to a large extent on the conditions under which the sources are processed. Organically grown or home grown produce is more likely to contain optimum amounts of mannose than produce that has been picked and stored for awhile. Heavily processed mannose sources are also less likely to contain the amount required for its beneficial properties to be effective.

The deficiency of mannose in the diet has been found to be connected to the consumptions of high quantities of processed foods and produce by the population. Organically grown produce that contains mannose in higher quantities tends to be less freely available and more expensive than processed foods.

Mannose deficiency has been linked to Carbohydrate Deficient Glycoprotein Syndrome (CDGS), a genetic metabolic disorder that affects the functioning of the entire body. The symptoms of this illness include early psycho motor retardation, accompanied by hepatic dysfunction. The condition deteriorates as the person gets older with retinal deterioration, seizures, lack of reproductive development in women and other features commonly seen in patients.

### ***History of Mannose***

The word "mannose" comes from the word "manna," the food that was eaten by the Israelites during their wandering through the desert. The word finds mention in the Bible as well as the Koran which refer to the food "that has been provided as sustenance." It is most commonly thought to refer to the secretion of the tamarisk tree that was plentiful in the Sinai Peninsula during those days. Its resin or wax was sweet to taste and yellow in color. This secretion was found to have the most similar characteristics to that of manna.

### ***Benefits of Mannose***

As a naturally occurring sugar, mannose has many uses when digested by the body and absorbed into the blood stream. It facilitates cellular interaction, and aids in tissue building. Small quantities of mannose are manufactured inside our bodies, but taking additional supplements can keep the kidneys and bladder healthy. Since modern processing and growing of foods limits the amount we can easily get through eating, these benefits are more difficult to obtain than they once were.

### ***Healthy Claims of Mannose***

Regular intake of mannose is found to boost the body's immune system. This, in turn, increases the body's ability to fight infections. Diseases like psoriasis, arthritis and respiratory illnesses are all linked to weakened immune systems, and mannose helps build up the body's defenses against these conditions. Better immunity means an enhanced ability to release anti bodies that can attack and destroy the invading cells, as well as controlling the actions of the white blood cells that play such an important part of staving off infections.

Mannose has been found linked to good urinary tract health. In the absence of mannose, UTIs tend to develop quickly. Because the sugar is rapidly absorbed into the blood and expelled naturally through urine, several doses of mannose though out the day are found to be better than a single large dose. The body needs to be replenished with mannose at frequent intervals to retain its beneficial properties.

Mannose maintains good urinary tract health without the use of antibiotics that can actually eradicate the healthy "good "bacteria that are beneficial to the body. Antibiotics can change the composition of bacteria creating conditions like gastrointestinal infections. Mannose simply removes undesirable harmful bacteria through urine, while leaving the good bacteria intact.

### ***Recommended Dietary Allowance for Mannose***

While there are no federal guidelines for taking mannose, packaged supplements such as **glyconutrients** will contain specific directions. Following these and drinking water are good recommendations. It is essential to take multiple doses as mentioned, rather than a single daily dose.

## ***Summary of Mannose***

Since mannose is so easily absorbed into the bloodstream and naturally expelled from the body, there are very few dangers arising from an overdose of mannose. Pregnant women however, are advised not to take mannose supplements without getting medical advice, because tests have linked large quantities of mannose to birth defects in the fetus. However, there have been found to be no side effects caused by the presence of the small quantities of mannose that are produced by the body naturally.

## **N-acetylglucosamine (GlaNAc)**

N-acetylglucosamine is a naturally occurring enzyme in the body. It is used in many the function of numerous bodily systems, most notably in the neurological system and the immune system. N-acetylglucosamine is one of the 8 essential sugars needed by the body for proper cell communication. It is often found in glyconutrient supplements. There are many health benefits to taking a supplement of n-acetylglucosamine or GlaNAc.

### ***Overview of N-acetylglucosamine (GlaNAc)***

GlaNAc is a monosaccharide derived from glucose. It is used in several biological systems within the body and is an important neurotransmitter that is used specifically in the pain pathways. GlaNAc is a natural carbohydrate, and while many people think that carbohydrates are bad for the body, this is actually a good carbohydrate. Without GlaNAc the body could not function properly and this would lead to numerous health problems, mainly neurologically based problems.

### ***History of N-acetylglucosamine (GlaNAc)***

GlaNAc was first discovered and recorded in 1984. The results of the research into GlaNAc discovered it is intracellular and a core ingredient in glycoproteins. Glycoproteins are the byproduct of the combination of essential sugars and proteins in the body. Glycoproteins are the actual enzymes which form the cell coverings that allow cells to communicate and therefore allow the body to function properly.

There have been many studies into the function of glycoproteins and the enzymes that help to form them. Much has been discovered about how they work within the body and the beneficial role that they play. It has been discovered that a lack of glyconutrients, like GlaNAc can lead to deficiency in the body of glycoproteins. This deficiency has been linked to numerous health problems, including Crohn's Disease and ADHD.

### ***Benefits of N-acetylglucosamine (GlaNAc)***

GlaNAc has proven to be quite beneficial within the body. It is a main factor in cartilage repair and has been found to be very helpful in aiding in the ability to learn in both humans and animals. It helps to repair the mucosal lining which assists in the digestive and intestinal systems of the body, and benefits the immune system. The secretion of insulin and prevention of the absorption of cholesterol are both aided by this substance.

GlaNAc has been found in large concentrations in the thyroid, liver, small intestine, endocrine glands and sebaceous glands. It has also been shown to suppress pain which goes a long way towards

improving quality of life in countless instances. In studies, GlA<sub>N</sub>Ac has also been shown to help suppress the growth of tumors and prevent the spread of viruses such as the flu and herpes throughout the body. Studies also have looked into the known connection with the nervous system and found that GlA<sub>N</sub>Ac works within the nervous system to aid in its healthy functioning.

### ***Health Claims of N-acetylglucosamine (GlA<sub>N</sub>Ac)***

N-acetylglucosamine (GlA<sub>N</sub>Ac) has been linked to numerous health conditions as a way of treating, curing or preventing them. It is thought to help suppress damage of the autoimmune response in patients with multiple sclerosis and type 1 diabetes, which may eliminate or reduce symptoms of the disease. It inhibits growth of abnormal T-cells which also helps in the prevention of multiple sclerosis and diabetes.

GlA<sub>N</sub>Ac has been used successfully to treat bowel disease. It is thought that its ability to help repair the mucosal lining in the gastrointestinal area allows it to help increase the resistance to such health problems as Crohn's disease, ulcerative colitis and other intestinal issues.

Osteoarthritis patients also report benefits from the use of this supplemented enzyme. It helps to prevent pain associated with the condition as well as improving both the range of motion and decreasing the inflammation of joints.

GlA<sub>N</sub>Ac also helps to boost the immune system which helps the body fight disease and illness. It has the ability to help prevent the spread of viruses within the body, and is often used as a treatment for autoimmune diseases.

GlA<sub>N</sub>Ac has also been used in the treatment of heart disease. Patients with heart disease often have lower than normal levels of GlA<sub>N</sub>Ac. This has prompted studies into the effects of supplementing the GlA<sub>N</sub>Ac in the body. Results to date are promising.

### ***Recommended Daily Allowance of N-acetylglucosamine (GlA<sub>N</sub>Ac)***

The recommended daily allowance of GlA<sub>N</sub>Ac is up to 100 grams. It has been shown to be safe in this dosage amount. It should be taken over a day's time, rather than all at once, as the excess will simply be expelled by the body. The typical dosage in supplements is 1500 mg to 2500 mg per day, which is still effective and provides results.

There are no known side effects or reported issues with taking GlA<sub>N</sub>Ac. It is generally deemed safe for human consumption and is safe for both adults and children. People taking other medications should check with their doctor before use so they can be monitored for possible side effects from drug interaction.

### ***Summary of N-acetylglucosamine (GlA<sub>N</sub>Ac)***

There is much demand for further study and research into the benefits and uses of N-acetylglucosamine. Further study could produce some amazing results that could prove to be the solution to a range of health problems. Modern medicine is starting to discover the benefits of alternative and natural medicine. That is why more and more natural supplements are being prescribed by doctors as treatment or supplemental treatment to prescription medicine. With more research, the revival in the use of natural substances in medicinal use is likely to continue.

Many people now see the harms of synthetic medication. Natural supplements and products, like GluNAC, have far fewer side effects and reactions. They are generally safe because they are natural and most are found in the body already. The benefits of all natural medications often outweigh those of synthetic medicines.

N-acetylglucosamine can be found as a nutritional supplement wherever nutritional supplements are sold. It is also found in **glyconutrient** supplements in the average, beneficial dosage amount. A supplement of GluNAC can be added to your daily routine to help boost your immune system and treat many underlying health conditions.

## **N-acetylgalactosamine (GalNAC)**

N-acetylgalactosamine is a monosaccharide derivative of galactose important for **boosting the immune system**. Reports have shown that it may help in prevention of inflammation, removal of free radicals, formation of collagen, and in healthy joint function. It is often used as a remedy for arthritis and is found in shark cartilage and is a constituent of chondroitin sulphate. It is also found with n-acetylglucosamine in the mother's breast milk. There is a red algae available in Japan, known as Dumontiaceae, that contains N-acetylgalactosamine.

Although N-acetylgalactosamine has not been researched to a great extent, it has been shown to inhibit tumor spread and help with the **cell-to-cell communication** process. Some studies have shown that people with heart disease have lower-than-normal levels of N-acetylgalactosamine.

## **N-Acetylneuraminic Acid (Neu5Ac)**

N-Acetylneuraminic Acid (Neu5Ac) is a sialic acid and a carbohydrate that has several important functions. Chief among these are the neutralization of toxins and monitoring of blood protein half life. N-Acetylneuraminic Acid (Neu5Ac) is found in human and animal tissues, especially in the glycolipids and glycoprotein.

It is found in especially large concentrations in the saliva, urine, breast milk, cerebrospinal fluids, serum and other fluids in the human body. Considerable concentrations are also found in the kidneys, brain, heart and the adrenal glands. The highest concentrations are found in the brain, kidneys, bronchial tubes, upper airways, skin, and reproductive organs. The fact that it is found in so many bodily fluids and organs have numerous indications for its potential use as both a symptom reliever and potential cure for several ailments.

### ***Overview of N-Acetylneuraminic Acid (Neu5Ac)***

N-Acetylneuraminic Acid (Neu5Ac) is manufactured by the action of certain enzymes in the body. It is readily absorbed after being ingested in the body, and also helps in regulating the metabolism of other sugars. It has a negative charge that causes the slippery texture of saliva and the mucins that appear on the surface of the organs in the body.

N-Acetylneuraminic Acid (Neu5Ac) is also found to be expelled quickly and naturally through the body through urination. It is not retained in the blood tissues. In fact, studies conducted on animals have found a concentration of up to 98 percent of N-Acetylneuraminic Acid (Neu5Ac) in the urine six hours after expulsion. In the case of humans, the data would translate to indicate a maximum of eight hours after ingestion.

N-Acetylneuraminic Acid (Neu5Ac) is found in abundance in whey protein isolate. In fact, this particular source has been found to be beneficial even in those who are normally lactose intolerant. Eggs are also a very good source of N-Acetylneuraminic Acid (Neu5Ac). For those who are unable to incorporate enough of these dietary sources, this substance can be found in supplement form as well.

### ***History N-Acetylneuraminic Acid (Neu5Ac)***

The discovery of N-Acetylneuraminic Acid (Neu5Ac) was made by a scientist who named the compound sialic acid. Later, a similar crystallized version of this substance was derived by another scientist who proceeded to name this neuraminic acid. Finally, a third scientist came to the conclusion that these two were the same compounds, and formed the third and final structure of the compound. It was decided to use "sialic acids" - taken from the Greek word "sialos" meaning "saliva" - " as the group name with N-Acetylneuraminic Acid (Neu5Ac) forming one of the core components.

### ***Benefits of N-Acetylneuraminic Acid (Neu5Ac)***

N-Acetylneuraminic Acid (Neu5Ac) is considered to be an immune moderator. It impacts the resistance of flow of mucus, and thus naturally defends the body against viral and bacterial infections. It acts as a decoy to ward off infections. It is also thought to have an increased importance during pregnancy in fetal development because the production of N-Acetylneuraminic Acid (Neu5Ac) is markedly increased during pregnancy. It boosts cellular interaction, and has also been shown to have protective properties against influenza, pneumonia, hepatitis and other diseases.

### ***Healthy Claims of N-Acetylneuraminic Acid (Neu5Ac)***

N-Acetylneuraminic Acid (Neu5Ac) is found in substantial quantities in the brain and kidneys, and this has led to speculation that it may play an important role in brain development as well as kidney functions. Intake of N-Acetylneuraminic Acid (Neu5Ac) is thought to decrease the risk of kidney stone formation.

It is also linked to improved memory and cognitive development. Its presence in the skin and the testes has also led to speculation that a supplement of N-Acetylneuraminic Acid (Neu5Ac) could be effective in the treatment of dermatological problems and reproductive issues. Also, it affects the coagulation of blood, and reduces levels of LDL or bad cholesterol in the body which indicates many possibilities for aid in heart related diseases.

N-Acetylneuraminic Acid (Neu5Ac) has been found to be effective in fighting against Influenza A and B. In fact, certain studies have found its flu fighting capabilities to be 100 times more advanced than most anti flu medications.

Increased levels of N-Acetylneuraminic Acid (Neu5Ac) during pregnancy seem to suggest that it strengthens the fetus' mental and physical development, as well as immunity levels. This early development is critical to the formation of a healthy child.

Lower levels of this substance appear to result in some common, yet serious, ailments. People who suffer from rheumatoid arthritis tend to have lower levels of N-Acetylneuraminic Acid (Neu5Ac) which seems to suggest a link between optimum levels of this compound and the prevention of this condition. Those who suffer from respiratory illnesses also have decreased amounts of N-Acetylneuraminic Acid (Neu5Ac) which has been connected to its effects on immunity.

In children who have defective metabolism of N-Acetylneuraminic Acid (Neu5Ac), symptoms like changes or roughening in the facial features, non pigmentation in the skin and hair, and regressed development are seen. There are developmental delays. Such children also may have enlargement of the liver and spleen.

Alcoholics and people who suffer from Sjogrens Syndrome show greatly reduced quantities of N-Acetylneuraminic Acid (Neu5Ac). It is suggested that supplements of this compound could help treat these conditions.

Research also indicates that N-Acetylneuraminic Acid (Neu5Ac) blocks the release of histamine, which reduces the severity of bronchial spasms, as well as allergic reactions.

### ***Recommended Daily Allowance of N-Acetylneuraminic Acid (Neu5Ac)***

There is no evidence to indicate that consumption of large quantities of N-Acetylneuraminic Acid (Neu5Ac) has detrimental effects on health. In fact, in studies conducted on animals, brain development was seen in a majority of the cases. No matter whether the supplement was given orally or intravenously, the beneficial effects of N-Acetylneuraminic Acid (Neu5Ac) on mental development were the same.

If a person has an impaired ability to absorb the sugar, however, there could be certain negative effects. In people who have a metabolic condition that inhibits absorption, the effects of the compound could actually be just the opposite of the benefits that others experience. For instance, there could be mental retardation, delays in development, problems in muscle co-ordination and enlargement of the liver. For a healthy 150 pound adult, a dose of 140 mg is considered to be a safe dosage.

### ***Summary of N-Acetylneuraminic Acid (Neu5Ac)***

N-Acetylneuraminic Acid (Neu5Ac) is a naturally occurring substance which performs numerous roles in the bodily fluids and organs of the human body. These include regulating toxins and regulating the metabolism. Implications are that normal levels of this substance are required for healthy fetal development. Also, it may act as a potential cure or symptom reliever for diseases ranging from alcoholism to kidney disease, and including arthritis and the flu. Research on this and other [glyconutrients](#) ingredients is ongoing and promising.

#### **Sources:**

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